

INTERNATIONAL CIVIL AVIATION ORGANIZATION

**16th MEETING OF THE DIRECTORS GENERAL OF CIVIL AVIATION
FROM THE EASTERN CARIBBEAN REGION**

**FORTE DE FRANCE, MARTINIQUE
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**DEVELOPMENT OF A GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)
REGIONAL AUGMENTATION TEST BED CAPABILITY**

CARIBBEAN AND SOUTH AMERICAN (CAR/SAM) REGION

Agenda Item 6: xxx

Information Paper

(Presented by the United States)

SUMMARY

This information paper provides a general overview of ICAO Regional Work Project RLA/00/009 for Latin America whereby the United States Federal Aviation Administration (FAA), International Civil Aviation Organization (ICAO) and the member States of the ICAO Regional Planning and Implementation Group for the Caribbean and South American (CAR/SAM) Region (GREPECAS) will cooperate to establish a Global Navigation Satellite System (GNSS) test capability to facilitate the regional transition to a satellite-based air navigation infrastructure. This cooperative project will create a CAR/SAM Satellite Navigation Test Bed (CSTB) to aid in the execution of both regional and State satellite navigation planning and implementation activities within an overall communications, navigation, and surveillance air traffic management (CNS/ATM) transition.

1. Evolution to Satellite Navigation

1.1 Transitioning to the use of satellite technology by aviation is a high priority for the International Civil Aviation Organization (ICAO) and the United States Federal Aviation Administration (FAA). Both of these organizations have researched and studied the benefits that the Global Positioning System (GPS) will provide to the aviation community and have made commitments for an expedient and full transition to GPS-based aviation operations as the cornerstone of a transition to a seamless regional communications, navigation, and surveillance air traffic management (CNS/ATM) environment.

1.2 This future satellite navigation capability has been labeled the Global Navigation Satellite System (GNSS) and will consist of *interoperable* regional augmentations, be *economically viable* for all service providers, improve *efficiency* for all users, and benefit *all modes of transportation* as well as multiple non-transportation related applications.

1.3 The FAA is committed to assisting ICAO and its member States with the education of, and planning for the implementation of satellite navigation technologies, as one of the inherent benefits of satellite navigation is its ability to improve the safety of flight and standardize navigation throughout the world. In March 1999, FAA Administrator Jane Garvey reiterated this FAA commitment while speaking to the ICAO Air Navigation Commission in Montreal, Canada and pledged its continued assistance to ICAO and its member States with this revolutionary transition.

1.4 At the forefront of the FAA's assistance to ICAO in this endeavor are the transition efforts within the Western Hemisphere regarding the implementation of both Wide and Local Area Augmentation System (WAAS/LAAS) technologies to supplement the current capability provided by the basic GPS Standard Positioning Service.

2. Satellite Navigation Transition Planning

2.1 The establishment of the CAR/SAM Augmentation Test Bed, or CSTB, is the initial step required to support and facilitate regional and State research, development, acquisition, and implementation efforts associated with a operational transition to satellite navigation. The CSTB will support a uniform implementation of GPS throughout the CAR/SAM region, establish a regional cadre of technical expertise, and will initially include a regional wide area augmentation system test bed capability that can be supplemented by country-specific local area augmentation capabilities at a later date.

2.2 The CSTB will assist ICAO and the CAR/SAM States to address the many issues that need to be considered when transitioning from a ground-based architecture to a space-based air navigation system. These issues can be broken down into *technical, operational, and institutional* focus areas. A concise description of these focus areas is included as information.

2.3 Technical Considerations

2.3.1 Technical items are concerned with analyzing the current aviation infrastructure and requirements, identifying desired capabilities, and deciding on the optimal architecture and mix of technologies that will meet future needs and demands in the most cost efficient manner. The CSTB can be used to gain insight into the final operational configuration, interface issues, user considerations, and other technical systems design and operational items. It can also prove invaluable in concept feasibility studies, gathering political and user support, conducting capability assessments on proposed system architectures, and providing for advanced technology familiarization and training.

2.4 Operational Considerations

2.4.1 Operational activities will ensure that the planned satellite navigation system architecture meets all operational requirements prior to its integration and public use. These activities will ensure a timely transition to new satellite navigation services by ensuring all operational issues are addressed prior to final system development, test, and installation. The main goal is to have all aspects of an air traffic control system prepared ahead of time to support the introduction of new satellite navigation capabilities, thus maximizing operational benefits throughout the region.

2.5 Institutional Considerations

2.5.1 Institutional activities focus on the Government actions necessary for the introduction of GPS-based navigation systems and services. These items are designed to resolve all issues relating to overall program management and support. The involvement of neighboring countries and other internal organizations that have similar interests will help garner support, leverage costs, and increase benefits across the region. These relationships and cooperative efforts between States need to outline joint objectives, roles, and responsibilities.

2.5.2 Civil aviation interest groups (commercial aviation, general aviation, cargo aviation, helicopters, service providers, equipment manufacturers, academia) also need to be involved from the very beginning to ensure that all user needs and requirements are recorded and addressed in the early stages of system design and development. These groups could also contain non-aviation groups who stand to benefit from the availability of a precise GPS-based navigation system throughout the CAR/SAM region (maritime, surface transportation, railways, etc.).

3. CSTB Project Overview

3.1 The CSTB project to establish a GNSS test bed capability will assist the States with defining, developing, and implementing a future operational GNSS capability within the CAR/SAM region.

3.2 The CSTB will establish an initial wide area test bed capability based on WAAS technology in the CAR/SAM region. This will be accomplished by supplementing three WAAS test bed reference stations (TRSS) and one master station (TMS) currently located in the Republic of Chile with an additional five TRSS that will be provided by the FAA and located throughout the CAR/SAM region. Current plans have these 5 TRSS located in Buenos Aires, Argentina; La Paz, Bolivia; Lima or Arequipa, Peru; Bogotá, Colombia; and Port of Spain, Trinidad y Tobago. In addition, Brazil will be providing an additional 5 TRSS and 1 TMS as its contribution to the establishment of the CSTB and the execution of regional and State flight tests. The 5 TRSS in Brazil will be located in Brazilia, Curitiba, Manaus, Recife, and Rio de Janeiro. The 1 Brazilian TMS will be located in Rio de Janeiro. The CSTB architecture may also include data from TRSS currently located in the Republic of Panama (1), Mexico (3), and United States (18) to conduct additional flight tests and operational scenarios throughout the entire CAR/SAM region.

3.3 Once the CSTB architecture has been established, the resulting GNSS augmentation capability will be used to collect data and conduct a series of tests, flight trials, system demonstrations, and capability assessments to determine the optimal use of satellite navigation. This system will also be used to evaluate potential changes to the existing air traffic routes within the region; thus taking advantage of the increase accuracy and flexibility of satellite navigation to result in decreased flight times, safer and more efficient air routes, and increase savings for both service providers and the user community.

3.4 In addition to the wide area augmentation capability that the CSTB will provide, the establishment of a local area augmentation capability and/or the use of an existing prototype LAAS capability within the region could be accomplished in order to evaluate the benefits and capabilities provided by LAAS technology to terminal operations in the region.

3.5 Exact timeframes for CSTB activities are not final at this time. Currently, the bilateral technical agreement between the FAA and ICAO to provide the 5 loaned TRSS has been drafted and is nearing completion and signature. Once this agreement is in place, the shipment process for equipment can be initiated and regional site preparations for the TRSS can begin in earnest. It is estimated that the CSTB architecture could be complete in the later part of 2001. Please note that these dates are preliminary and simply approximations at this time.

4. Conclusion

4.1 The Caribbean and South American (CAR/SAM) States have agreed through the appropriate ICAO regional group to transition to a revolutionary communications, navigation, and surveillance air traffic management (CNS/ATM) air navigation architecture. The initial and enabling technology to support this transition is the Global Positioning System (GPS) and its associated wide and local area augmentation technologies.

4.2 Supporting this transition, the CAR/SAM States have initiated a project, with ICAO and FAA assistance, to develop a regional GNSS Test Bed capability using GPS, WAAS, and LAAS technologies as the foundation. The CSTB concept will leverage operational implementation costs for all states through cost-sharing of a regional test infrastructure that will be applicable to the operational environment (i.e., site selection and preparation, secure terrestrial communications links, operational procedure development, aircraft certification, training, etc.). This project will encourage cooperation in the establishment of a standardized regional satellite navigation capability that will support and compliment more precise terminal satellite navigation applications within various States' airspace. The resulting satellite-based air navigation system will provide increased flight safety and system efficiency to support Latin American aviation well into the 21st Century.

5.0 Recommendation

5.1 The meeting is requested to note the material presented in this information paper, and consider its contribution to the overall CNS/ATM transition efforts within the CAR/SAM region. This project is being coordinated through the ICAO GNSS Task Force of GREPECAS, and additional information will be provided as more details are agreed upon and available.